

Another series of experiments was made upon Mr. Cunningham, a young man about 5 feet 2 inches in height, and of light build. The maximum value of n is here reached when the length of the rope was about ten feet, and here the time of a full swing was about 4.1 seconds.

My own height being about five feet eleven inches, it will be observed that these two cases are sufficiently representative.

Cunningham.

l	t	n
12	4.3	14.0
11	4.3	16.3
10	4.1	17.0
9	3.8	14.6
8	3.7	12.6

The swing was shortened by drawing the rings up from the ground, and in the latter table the values of n for short ropes are a little too small, as he seemed fearful of falling. Hence we may affirm that in order that this and similar evolutions may be elegantly performed, the time for the full swing should be four seconds.

The cause of rapid fatigue with long ropes is that the body must be held in a constrained position for too long a time. With very short swings the muscles are forced to work with too great a velocity.

The muscular action is here too complex to allow of any mechanical discussion, but the general results are exactly what the discussions of Prof. Houghton might have enabled us to predict.

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NOTES

THE demise of such veterans in biology as Von Baer, Ehrenberg, &c., during the past year has left gaps in the lists of honorary fellows of our scientific societies which come to be filled up with men almost of a different generation, yet worthy successors of the great masters departed. We understand the three subjoined *savans* have recently been elected foreign members of the Linnean Society—viz., Pierre Du Charte of Paris, highly distinguished for his researches in teratological, physiological, and other branches of botany; Prof. Carl Gegenbaur of Heidelberg, whose labours in zoology and the comparative anatomy of the vertebrates and invertebrates are acknowledged as of the highest standard; Prof. Rudolph Leuckardt of Leipzig, by whose philosophical investigations into the morphology and physiology of the lower forms of animals and establishment of the group coelenterata, zoologists of all countries are highly indebted.

WE are glad to hear that Dr. Dohrn's Zoological Station continues to make satisfactory progress. The number of naturalists who have availed themselves of the institution, we are informed, has reached eighty, from almost all parts of Europe. The summer dredging with the small steamer will now shortly commence, and we may hope that besides the important physiological work which is there done, that a complete knowledge of the rich fauna of this bay will be a further result furnished by this station. The institution is carried on under the direction of Dr. Dohrn, the detail management being in the hands of Dr. H. Eisig, who is backed up by two assistants. The aquarium belonging to the station has in their hands for some time been the most successful in Europe, and naturalists we do not doubt will find the experience gained by some years working enables their wants to be more readily provided for. A statement has appeared in an English paper which might lead one to think some change had been made, but we are in a position to state

that no alteration has been made, and that with increased opportunity of collecting material the institution will become each year more useful.

ALTHOUGH M. Leverrier's health is so unsatisfactory he continues to attend to his professional duties as persistently as ever. The number of stations organised by him in connection with the international service now exceeds 1,200. He is preparing instructions to be sent to each correspondent on the method of better utilising warnings from the Observatory. He confesses that the agricultural service is in a period of uncertainty, and that some time must elapse before it can render much service to the commonwealth. He urges strong reasons why the service—not conducted by military men, as in America—should be conducted by men accustomed to military discipline.

THE primary clock of the Paris Observatory is now regulating the motion of the clocks of the Conservatoire, St. Sulpice, and the Luxembourg. M. Leverrier proposes to adapt the same system to a number of other public clocks, and even to those which are used in the cab stations. But the application of the system is delayed for want of funds.

PROF. RUPERT JONES, F.R.S., is preparing a new edition of Dixon's valuable "Geology of Sussex" for Mr. W. J. Smith, of Brighton. The work will be brought up to the present state of knowledge. The descriptions and lists of Sussex fossils will be carefully revised in this new edition, and a full account will be given of the Sub-wealden boring and its results, of the Warren-Farm Well, and of the archaeological discoveries at Cissbury and elsewhere in Sussex. It is also arranged that a selection of the original quarto plates of Mantell's "Fossils of the South Downs; or, Illustrations of the Geology of Sussex" (1822), with descriptions according to our latest knowledge of the subjects, shall form part of the new volume.

A NEW application of the principle of the magic-lantern has been lately introduced into London for drawing attention after dark to the names of restaurants and shops. At present it is only used where the establishment has a lamp overhanging the pavement. The lenses are fitted into the bottom of the lamp, the words to be read are painted on the "slide," which has an opaque ground, and thus the advertisement is thrown in letters of light on to the pavement. Ordinary gas lamps are used, and when the apparatus is once fixed the announcement appears every time the lamp is lighted without any further trouble.

THE anniversary meeting of the Geographical Society was held on Monday, and as usual, a large increase of numbers was reported, as well as the prosperity of the Society generally. The president, Sir Rutherford Alcock, reviewed the progress of geographical science during the year, a year remarkable by the return of three important expeditions to England—the *Challenger*, the Arctic, and that under Lieut. Cameron. The medals, the award of which we have already announced, were presented to Sir George Nares, the Pundit Nain Singh, and Capt. Markham. The president, in concluding his address, announced that the Society's African Exploration Fund Committee were about to appeal to the Society and the public for support and co-operation in the prosecution of continuous and systematic African exploration. In view of the interests concerned in this work, the Council felt confident that their appeal would meet with a ready response, not only in the United Kingdom, but in all our colonies.

ON the evening of June 5 the first trial, in this country, of the Jablochkoff electrical light will be made at the West India Docks. The object of this trial is to test the applicability of this new light to purposes of lighting up of docks, warehouses, &c., in order that work may be continued during the night.

"SUMMER Schools" are becoming a regular institution in America, and no more pleasant way could be devised of combining the *dulce* and the *utile* than that of a proposed aquatic summerschool of natural history, which, under the direction of Prof. Theodore B. Comstock, of Cornell University, expects to charter a large steamer, and spend the summer around the shores of Lake Superior in the study of the geology and natural history of that region. The steamer will accommodate from seventy-five to one hundred passengers, to be made up of students and professors. Regular instruction will be given in the form of lectures during the voyage, and every facility afforded by the examination of mining localities and the like. The vessel will probably start from Cleveland or Detroit on July 7, and proceed thence to Lake Superior, making its full circumnavigation. The coast of Georgian Bay, on Lake Huron, will be investigated on the return voyage. The expense will probably amount to about 125 dollars for each person. In addition to the aquatic summer school mentioned above, Harvard University announces two special summer courses of instruction, one in zoology and the other in geology.

THE progress of industry in France (denoting by industry the working of raw material) has been very rapid, much more rapid, proportionally, than that of agriculture. We learn from *La Nature*, that in half a century, the employment of cast iron, so necessary to industry, has been multiplied tenfold, and that of coal twenty-fold. The total power of steam-engines has increased in still greater proportion; it is at least thirty times greater than it was in 1840. Going further back, the proportion would be less interesting, as steam was used in but few establishments. In 1820 there were only sixty-five steam-engines in the whole of France. As an acquisition of material force these engines represent in value at least 25 million workmen, added to the 10 million who labour in workshops, and to the motor forces furnished by nature gratuitously, air and water. There are in France nearly 40,000 weirs, the falls from which work more than 80,000 mills of every kind, and this number might be doubled. In some parts, lastly, they are beginning to utilise the force of the tide.

At a recent meeting of the French Physical Society M. Gouy gave an account of experiments he had made on flames produced by a mixture of air and coal-gas, holding in suspension pulverised metallic salts. The salts, dissolved in water, were introduced by a pulveriser, acting with air compressed to half an atmosphere. In these flames the blue surface of the interior cone, which gives the spectrum of carbon, gives also the lines proper to the salt which the flame contains. These lines are not visible beyond this part, and they coincide with the principal lines of the metal in the electric spark. The metals sodium, strontium, magnesium, lithium, manganese, iron, cobalt, bismuth, cadmium, zinc, and osmium give this phenomenon distinctly. Platinum gives a special spectrum formed of regular bands. These experiments seem to prove that there is at the base of the flame a very fine layer which has a temperature much higher than the flame properly so-called.

THE exploration of the Angara, proposed by the Russian Geographical Society, has taken a yet larger extension. M. Sibiryakoff, who has presented a gift of 2,000 roubles, proposes to undertake also the exploration of the water-parting between the Obi and Jenissei, to solve the question of the practicability of a canal between the two rivers. Owing to the great commercial importance of such a canal, the Geographical Society has agreed to the proposal of M. Sibiryakoff, and will send an expedition for that purpose.

NEAR Lake Ourmia (N.W. Persia), a hill near Digala is irregularly excavated by a number of galleries for its nitrous earth, strongly impregnated with saltpetre. This loose, friable soil,

of brownish colour, in irregular horizontal beds, includes layers of a mostly amber-brown earth, with layers of bone-ash, intermixed with large and small fragments of human bones, charred remains of straw, and thin seams of carbonised seeds of cereals. Fragments of burnt earthenware are scattered through this bed, and through the whole of the hill. Nearly in the middle of the hill is a conical hollow, cylindrical above, and becoming narrower upwards, like the inside of a high furnace. The inner wall shows four or five ranges of repositories, several feet distant from each other, and made of slabs of eocene sandstone, about 1½ ft. broad. These slabs of a rust-brown colour, bear evident traces of having been exposed to a fierce fire; and the whole chamber may thus be inferred to have served for a furnace to burn dead bodies. This view is confirmed by the traditions still extant among the surrounding people. Fragments of large pot-like vases, and of coffins made of slabs of sandstone, both inclosing an earthy residuum, mixed with fragments of skulls and bones show that in the same place, burials have been effected without cremation. The abundance of saltpetre in the soil of the hill has probably been derived from the nitrogen set free by the decomposition of organic remains.

THE *Phormium tenax* or New Zealand Flax, is, it is said, being largely planted in St. Helena, on behalf of a fibre company, who propose so to plant all the Government waste lands in the island.

WE have received from Dr. Petermann a very useful map issued in connection with the Russo-Turkish war. Its purpose is to show at a glance the relative position of the boundaries of Russia, Turkey, Persia, and British India. It extends from Bosnia to Central Asia, and from the north of the Black and Caspian Seas to the Indian Ocean, and includes enlarged special maps of the Nile Delta and of Crete.

THE first field-day of the Liverpool Geological Society was held on Saturday last. The members and their friends proceeded to Crosby by rail and from thence by bus through Little Crosby, Hightown, Altcar, Downholland, Has Rayne, to Hallsall, and back again through Lydiat and Maghull to Sefton, where they had tea and examined the church. The object of the visit was to examine the great post-glacial deposits of the West Coast of Lancashire. The party was guided by Mr. T. Mellard Reade, C.E., F.G.S., who described the succession of the beds and their superficial extension. He explained that what they had seen was only a part of a very extensive series of deposits surrounding our coasts and found at most estuaries. The society last May examined a portion of the same series disclosed by the North Dock excavations, and the present excursion would enable them to better understand this most interesting part of the geology of Lancashire. At the Alt Mouth was found a peat and forest bed between high and low water-mark washed daily by the tide. The moss land between the inland edge of the 25-feet plain was only an extension of this sub-marine forest which passes under the sand hills and joins the moss. Under the moss lies the main silts with here and there some freshwater deposits on the surface.

SOME interesting disclosures were made last week at the Marlborough Street Police Court as to the method on which certain war maps are constructed. A certain publisher, whose name is probably unfamiliar to most of our readers, has published one of those exaggerated pictorial maps of the seat of war so attractive to the indiscriminating public. We have seen the map, and a very misleading and rude specimen of cartography it is. Its natural defects are bad enough, but it came out during the proceedings that intentional errors—names of non-existing places and wrong positions of existing places, were introduced for the purpose of detecting

imitations. The magistrate, Mr. Newton, was therefore to a considerable extent justified in stating that the designer of the map seemed to have constructed it out of his own brain, and he virtually dismissed the summons.

FROM the report read at the annual meeting of the Nottingham Literary and Philosophical Society, we see that it now has 352 members of various classes. The Society has had several scientific lectures during the session, and we are specially glad to see that the Natural Science Section is in a flourishing condition, having had twenty-nine meetings and excursions during the session, at which papers were read on various subjects of scientific interest.

THE Société Française de Navigation Aérienne, an institution which has been approved by the Minister for Public Instruction, is to organise a collective exhibition at the Champ de Mars. It will include any means of propelling and governing in the air. Any instrument which has proved efficacious in some degree will be admitted if its dimensions are not too large, or by model, if otherwise. Any apparatus for making aerial observations, or helping aeronauts in any way will be admitted. The collection will also include maps, books, manuscripts, and newspapers relating to aerial navigation.

WE have received from Dr. Warren de la Rue a small pamphlet containing two sets of tables which must prove of great use to most scientific workers. There are tables for the reduction to 0° centigrade of a mercury column observed with a glass scale divided into millimetres, and tables for the reduction of millimetres (mercurial pressure) to thousandths and millionths of an atmosphere, and *vice versa*. These tables are printed for private circulation.

AN important Russian work has just been published by Prof. Inostrantsef—"Geological Sketch of the Poyenetz District, Government Olonetz, and of its Mines." This large volume (750 pp.), being the result of seven years' explorations, contains detailed reports on the travels of the author, an orographical description of the district (the surface of which exceeds that of Switzerland), an interesting chapter on the metamorphism of the green slates, and a sketch of the glacial formations. It is accompanied by maps, engravings, and chromolithographed plates representing microscopical cuttings of rocks.

THE additions to the Zoological Society's Gardens during the past week include an African Turkey Buzzard (*Buteo tachardus*) from Africa, presented by Mr. A. Anderson, F.Z.S.; two Rendall's Guinea Fowls (*Numida rendalli*) from Bogos Country, Abyssinia, presented by Capt. Burke, s.s. *Arcot*; three Carpet Snakes (*Morelia variegata*) from Australia, presented by Mr. J. Moseley; a Guianan Crested Eagle (*Morphnus guianensis*) from the Upper Amazons, a Green-necked Pea-fowl (*Pavo spicifer*) from Java, two Barred-tailed Pheasants (*Phasianus reevesi*) from North China, a One-wattled Cassowary (*Casuarius unipenniculatus*) from New Guinea, a Great-headed Maleo (*Megacephalon maleo*) from the Celebes, purchased; an Inconvenient Curassow (*Crax incommoda*) from South America, deposited; a Derbian Wallaby (*Halmaturus derbianus*) born in the Gardens.

OUR ASTRONOMICAL COLUMN

COMETS OBSERVED BY HEVELIUS.—Of the eight comets observed by Hevel, better known as Hevelius, at Dantzic, with such degree of precision as could be attained with his instruments, the observations of two only have been reduced with the aid of modern places for comparison stars, &c., and in these two cases only have we other orbits than those calculated by Halley, which appear in his *Synopsis Astronomiæ Cometicae*. The observations of the comet of 1664 have been discussed by Herr

Lindelof, with the view of ascertaining whether any support were afforded by them, to a conjecture of identity of the comet, with the first comet of 1853; and those of the comet of 1683, were similarly reduced by Mr. W. E. Plummer, in his examination of the elliptical tendency of the orbit indicated by the computations of Prof. Clausen, who had previously recalculated a few of the observations. There remain the comets of 1652, 1661, 1665, 1672, 1677, and 1682; Mechain's reduction of the observations of the second of these bodies nearly a century since, will hardly be considered final.

The observations of the comets of 1672 and 1677 were published in the second volume of the *Machina Cœlestis*, and in small special treatises. This second volume of the great work of Hevelius, as is well known, is extremely scarce, the whole of the impression, with the exception of such copies as had been already presented to astronomers having been lost in the fire which destroyed the observatory, library and papers of Hevelius on September 26, 1679. The copies thus saved were [so few in number, that as Lalande remarks "On peut regarder cet ouvrage comme un manuscrit;" and the special treatises to which we have alluded are perhaps of equal difficulty of access. The observations of the comets of 1652 and 1661 were printed in the *Cometographia*, not a work of very great rarity, as well as in the scarce volume of the *Machina Cœlestis*; those of the comet of 1665 also appear in this volume, in a special treatise, and in the *Prodromus Cometicus*, while those of the comet of 1682 (Halley's comet) are found in *Annus Climactericus*, and have been fully utilised.

A new reduction and discussion of the observations of the comets of 1652, 1661, 1665, 1672, and 1677, is certainly a desideratum, and important assistance in this direction might be afforded by a republication of the original observations of Hevelius from some quarter where the scarce volume is accessible. Mädler remarks upon a certain degree of resemblance between the elements of the comet of 1672 and those of the comet of 1812, which is shortly expected to return to perihelion; and it has been pointed out in this column that Halley has given the descending in place of the ascending node, for a comet observed in 1686—an oversight which has found its way into all catalogues of cometary orbits hitherto published, so that a re-computation of the orbits of the five comets we have mentioned, which now rest upon the figures of the *Synopsis Astronomiæ Cometicae* is wanted, if only for verification.

"THE OBSERVATORY."—The second number of this new periodical is before us. Mr. David Gill continues his paper on "The Determination of the Solar Parallax;" we have the first part of an article giving the substance of a lecture recently delivered at Gresham College, by the Rev. E. Ledger, on "The Scintillation or Twinkling of the Stars," which has long been an obscure subject; Mr. Marth continues his Ephemerides for aiding physical observations of the Moon, Mars, and Jupiter; and there is also a report of the proceedings at the last meeting of the Royal Astronomical Society, including the discussion on the papers read, which, as was mentioned in a previous notice, it is intended should form a feature of the publication. We think every one who is competent to judge of the actual state of the case will agree in the opinion expressed at p. 55, while remarking on Mr. Todd's extension of Damoiseau's Tables of Jupiter's Satellites to the end of the present century, that "the time has hardly yet come for the formation of entirely new Tables." So far as regards the necessary observations, it must be admitted that they are being followed up with vigour at several observatories. The first binary star orbit on p. 58, refers to ξ Scorpii (ξ Libræ of Flamsteed), not to ζ Libræ; the error, however, is made in the *Astron. Nachrichten*, whence the orbit is taken.

L'ÉTÉ DE LA SAINT-MARTIN ET LES ÉTOILES FILANTES.—In No. 493 of the *Bulletin Hebdomadaire* of the French Scientific